

lated the invariant E. Its value was given at length in the second edition, where it occupied thirteen pages, but I have not thought it worth while to reprint so long a formula." Yet to the volume which contained this elaborate investigation and many others involving equal skill and almost equal labour he prefixed the words:—"To A. Cayley, Esq., and J. J. Sylvester, Esq., I beg to inscribe this attempt to render some of their discoveries better known, in acknowledgment of the obligations I am under, not only to their published writings but also to their instructive correspondence."

Questions of priority must be left to some more learned pen, and to a writer who has less reason to revere Salmon and to respect his reticence. The value of his work is shown by the number of the editions and of the translations of his treatises, and by the honours he received from every quarter. To a friend who might question him about his honours he would say, "You will find all about them in that drawer." He received them with humility, though he well knew he was worthy of them.

DR. W. FRANCIS.

DR. WILLIAM FRANCIS, whose death we recorded last week, was born in London in February, 1817. After his school-time, spent partly at University College School, but chiefly in France and Germany, at St. Omer, Cravelt, and Gera, he studied for a short time at University College, London (then known as the University of London), whence he proceeded to the University of Berlin and subsequently to Giessen, where Liebig was then at the height of his scientific activity. Here he took the degree of Doctor of Philosophy in 1842. His long residence abroad, supplemented by frequent subsequent journeys, many of them on foot, gave him an accurate knowledge of French and German, and enabled him to become personally acquainted with a very large number of the leading men of science on the Continent.

In 1842 he established the *Chemical Gazette*, which he continued to edit until December, 1859, when it was merged in the *Chemical News*. By this publication and by the translations and abstracts he contributed for many years to the *Philosophical Magazine*, he did valuable service in making known the work of foreign chemists to their English colleagues. Among other work of the same kind were translations of important foreign papers, including Ohm's "Die galvanische Kette mathematisch bearbeitet" and Helmholtz's celebrated paper, "Die Erhaltung der Kraft," for Taylor's "Scientific Memoirs." From 1851 until his death he was one of the editors of the *Philosophical Magazine* and of the *Annals and Magazine of Natural History* from 1859. His wide acquaintance with various branches of science, as well as with leading scientific men at home and abroad, made him well fitted for these functions, and the sound judgment with which he discharged them is generally recognised.

Dr. Francis was one of the original members, probably the last survivor of them, of the Chemical Society, having been elected an Associate in 1841 and a Fellow shortly afterwards. He was elected a Fellow of the Linnean Society in 1844. He was also a Fellow of the Royal Astronomical Society and an original member of the Physical Society. For the greater part of his life Dr. Francis was actively engaged in business as a partner, since 1852, in the well-known firm of Taylor and Francis, successors of Richard and John E. Taylor, printers and publishers.

He died at his residence, the Manor House, Richmond, on January 18.

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NOTES

A PROVISIONAL committee has been formed with the object of commemorating the scientific work of the late Prof. A. Cornu by means of a medal struck for that purpose. The committee includes more than fifty members of the Institute of France; and the secretary is M. E. A. Martel, 8 Rue Me'nars, Paris.

THE King, accompanied by the Queen, opened Parliament in state on Tuesday. In the King's speech reference was made to the insufficiency of the supply of the raw material upon which the cotton industry of this country depends, and the hope was expressed that the efforts which are being made to increase the area under cultivation in various parts of the Empire will be attended with success. Among the measures to be introduced is a Bill to amend the laws relating to education in Scotland.

A LAFFAN message from Rome states that the Academy of Sciences at Turin has divided the Ballauri prize of 1200*l.* between Signor Marconi and Prof. Grassi, of Rome, and has awarded the Brasso prize of 350*l.* to the Duke of the Abruzzi.

DR. D. H. SCOTT, F.R.S., has been elected president of the Royal Microscopical Society for the ensuing year.

THE *Daily Chronicle* announces the death of Mr. W. G. McMillan, secretary to the Institution of Electrical Engineers.

THE petition of the Linnean Society of London praying for the grant of a supplemental charter has been referred to a committee of the Lords of the Privy Council, and is down for consideration by their lordships on March 1.

A PETITION in support of the Bill for the adoption of the metric weights and measures, which will be introduced in the House of Lords by Lord Belhaven and seconded by Lord Kelvin, is being extensively signed throughout the kingdom.

PROF. HENRI CORDIER, of the School of Modern Oriental Languages at Paris, has been appointed president for 1904 of the Geographical Society of Paris.

THE thirty-first annual dinner of the old students of the Royal School of Mines will be held on Friday, February 26, at the Hotel Cecil. The chair will be taken by Mr. A. G. Salamon. Tickets may be obtained from Mr. David A. Louis, 77 Shirland Gardens, London, W.

At the annual meeting of the Psychical Research Society held on January 29, it was announced that the fund intended to endow a research scholarship had reached 6195*l.*, but a minimum of 8000*l.* is needed. Sir Oliver Lodge, the retiring president, introduced the new president, Prof. W. F. Barrett, who delivered his presidential address.

It is proposed to hold a horticultural and gardening exhibition in the month of June next under the auspices of the Royal Botanic Society in the new exhibition grounds of the society, situated in the centre of the Botanic Gardens in Regent's Park. The proposed scheme embraces horticulture, forestry, botany, educational methods, nature-study, and a special section for colonial produce. In addition to the exhibition, lectures and conferences are in course of arrangement.

GRANTS in aid of research have recently been made from the Rumford fund of the American Academy of Arts and Sciences as follows:—to Prof. E. W. Morley, for his research on the nature and effects of ether drift, 100*l.*; to Prof. Carl Barus, for his research on the study by an

optical method of radio-actively produced condensation, 40l.; to Mr. J. A. Dunne, for his research on fluctuations in solar activity as evinced by changes in the difference between maximum and minimum temperature, 40l.

At the ordinary quarterly meeting of the Royal College of Physicians held on January 30, Sir William Church announced that Dr. Horace Dobell, of Parkstone Heights, Dorset, had presented a sum of 500l. to the college for the promotion of original research into the ultimate origin, evolution, and life-history of bacilli and other pathogenetic micro-organisms. The conditions are that the president and censors of the college shall select a lecturer once in every two years, who shall give a record of original researches on the above subject, made by others and himself, and that he shall receive a fee of 50l. for so doing. These lectures are to be continued biennially, as long as a sufficient amount of the 500l. and its accumulated interest remains. The first lecture will be delivered during this year.

THE death is announced of Mr. William Vicary, of Exeter, who had an intimate acquaintance with the local geology and possessed a fine collection of fossils, chiefly from the Upper Greensand of Haldon and Blackdown. He first directed attention to the occurrence of fossils in the quartzites of the Triassic pebble-bed of Budleigh Salterton. The death is also announced of Mr. Alfred Gillett, of Street, near Glastonbury, in his ninetieth year. He gathered together a fine collection of fossils, which he presented in 1887 to the Crispin Institute at Street. One of the gems, however, an almost entire skeleton of *Ichthyosaurus tenuirostris*, obtained from the Lower Lias of Street, and personally developed by Mr. Gillett, was presented to the British Museum (Natural History).

NEWS of the sudden death of Miss Anna Winlock, a member of the staff of the Harvard College Observatory, has reached us from Boston. Miss Winlock's first official computing work at the observatory was done in 1875. Later she passed to more advanced work, as she was conversant with most branches of mathematics as applied to astronomy, had studied various methods of star reduction, and understood the use of the theory of probabilities. She did a large part of the computation for Prof. Rogers's zone work, of which a description is given in vol. xv. of the *Annals* of the observatory. In 1886 Miss Winlock was joint author with Prof. Rogers of a paper on "The Limitations in the Use of Taylor's Theorem." In connection with the photographic work of the observatory a convenient catalogue of close polar stars was needed, and this work was carried out by Miss Winlock for both the north and south poles. The result of this work was the most complete catalogue of close polar stars ever made, and the best means of comparison of different observations. The next important piece of work done by Miss Winlock was the catalogue published in the *Annals* of the observatory of the positions of five hundred stars near the North Pole, which had been observed photographically. After the discovery of the minor planet Eros, some work of the same nature was done by Miss Winlock, in determining its precise position from photographic plates. Her death deprives astronomy of one whose faithful and exact work has a permanent value.

MESSRS. BURROUGHS, WELLCOME AND CO. have issued a reprint of the historical souvenir on "Antient Cymric Medicine" prepared by Mr. Wellcome on the occasion of the meeting of the British Medical Association at Swansea, 1903. The pamphlet, which is profusely illustrated, contains much interesting information.

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LAST autumn a commission of the American Marine Hospital Service reported that it had discovered a protozoan parasite, the so-called *Myxococcidium stegomyiae*, in the yellow fever mosquito, *Stegomyia fasciata*, that had bitten yellow fever patients. Dr. James Carrol now states (*Journ. Amer. Med. Assoc.*, November 28, 1903) that this supposed protozoon is merely a yeast fungus accidentally infecting the mosquitoes, and has nothing to do with the transmission of yellow fever.

POPULAR confirmation of the value of scientific methods and advice is always welcome. In a letter to the secretary of the Liverpool School of Tropical Medicine, the Booth Steamship Company gives an extract from the log of its steamship *Javary*. Her captain reports that the mosquito nets supplied by the company have been a great boon to the men, and that whereas cases of malaria were formerly frequent, sometimes resulting fatally, since the introduction of the nets and their general adoption the crews have enjoyed a wonderful immunity from sickness.

THE January number of the *Journal of Anatomy and Physiology* (part ii., vol. xviii.) contains a number of papers of anthropological, anatomical, physiological, and embryological interest, and is illustrated with several plates. Mr. Wright describes a number of skulls obtained from the round barrows of east Yorkshire, Mr. Lewis discusses the functions of the spleen and other hæmolymp glands, and Prof. Elliot Smith publishes a note on an exceptional human brain presenting pithecoïd abnormality. Prof. Arthur Robinson's first Hunterian lecture on the early stages in the development of mammalian ova is printed *in extenso*, and Dr. Beard gives another instalment of his article on the germ cells.

MESSRS. A. E. STALEY AND CO., of 35 Aldermanbury, E.C., have sent us a prism binocular which magnifies eight times, and costs five guineas complete in a solid leather case. It is strongly made, weighs barely 12 ounces, and has a fairly large field of view. It differs from many other glasses of this construction in that there is no means of altering simultaneously the focus of the two sets of lenses. It is intended that each eye-piece should, in the first place, be focused carefully on an object situated at a distance of about 300 yards, the divisions on each of the eye-pieces being carefully noted. For all objects distant 100 yards or further from the user the glasses are in focus without any other manipulation, and are therefore always ready and in adjustment. If the glass be employed for nearer objects this principle is not satisfactory, for then each eye-piece would have to be focused separately, which would entail time. The general use of such binoculars is thus somewhat restricted, but for those who would employ them for such purposes as stalking, yachting, shooting, &c., and who thus do not require shorter ranges than 100 yards or so, they should be of service. The elimination of the arrangement for focusing both eye-pieces together renders it possible to make the glasses lighter, stronger, and more secure from derangement. An examination of their interior shows the simplicity of construction, and the definition leaves little to be desired.

THE *Atti dei Lincei*, xii. (2), 12, contains a biographical notice of the late Prof. Luigi Cremona, by Prof. G. Veronese, together with a list of his principal writings, eighty in number.

IN a supplement to the *Communications* from the Leyden Physical Laboratory, Dr. J. E. Verschaffelt discusses, with a diagram, the form of the Van der Waals Psi surface in

the neighbourhood of the critical point for binary mixtures with only a small proportion of one component.

A NOTE on the b constant of Van der Waals's law is contributed by Mr. J. D. van der Waals, jun., to the *Physikalische Zeitschrift* for January 1. By different methods Van der Waals and Boltzmann have arrived at the formulæ $b = b_{\infty} - 17b_{\infty}^2/32V$ and $b = b_{\infty} - 3b_{\infty}^2/8V$, and the writer now claims to have proved that the latter is the correct value.

A PORTRAIT of the late Father Stephen Joseph Perry, F.R.S., director of Stonhurst Observatory, is reproduced in *Terrestrial Magnetism and Atmospheric Electricity* for September, 1903 (recently received), accompanied by a short biographical sketch. Prof. H. F. Reid contributes to the same number a short account of the second International Seismological Conference which met in response to a call from the German Government at Strassburg from July 24 to 28 of last year to discuss the formation of an International Seismological Association.

INTERNATIONAL balloon ascents, both manned and unmanned, were made on November 5 and December 3, 1903, by many European countries (the British Islands excepted), and kite observations were also made at the Blue Hill Observatory, United States. The highest altitudes attained were:—Trappes (near Paris) 16,000 and 14,800 metres, and Itteville (near Paris) 11,200 and 10,800 metres. At Zürich the balloons reached 13,000 and 17,000 metres. Kite observations were also made at Torbino, at the private observatory of M. Demtschinsky. From its northern position, latitude $58^{\circ} 38'$, not far from Pavlovsk, these observations are of special interest. The meteorological results will be published later on.

WE have received the report of the chief of the U.S. Weather Bureau for 1903; it contains a most interesting summary of the great work carried on by that department, furnishes ample proofs of the usefulness of its operations, and gives great hopes of ultimate improvement of our present knowledge of meteorological conditions. The operations of the U.S. Weather Bureau are naturally of much greater proportions than can be possible in our own country. It issues each morning (Sundays and holidays excepted) about 25,000 maps exhibiting graphically, with text and tables, the weather conditions at 8h. a.m.; about 50 per cent. of these maps are produced at the larger outlying stations of the bureau. The expenditure on various branches of the service amounts to one and a quarter million dollars, and the independent comments of the Press give evidence that the high average of success of the warnings of storms and of cold waves affecting agriculture and crops "brings an adequate return to the commerce and industries of the country." Prof. Willis Moore states that the Weather Bureau has for some years been carrying on an investigation into the fundamental problems as to the true causes of weather conditions, and that the construction of high-level charts based chiefly on cloud observations points unmistakably, in Prof. Bigelow's opinion, to a theory which will supersede those heretofore published in meteorological literature. With reference to the problem of seasonal forecasts, Prof. Moore states that meteorology is really a very closely allied but difficult branch of solar physics, and ought to be studied with the aid of a fully equipped observatory devoted especially to such researches. In this sense suitable reference is made *inter alia* to the Solar Physics Observatory at South Kensington, which is putting forth valuable results under the directorship of Sir Norman Lockyer.

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THE third number of *Spolia Zeylanica* contains an exceedingly interesting account, by Mr. Everard im Thurn, the Lieutenant-Governor of the island, of last year's pearl-fishery in Ceylon. This fishery took place after an interval of eleven years, and the gathering of both Europeans and natives was consequently very large. The results are not yet made known. Mr. im Thurn himself donned a diver's dress and descended to the oyster-beds—a depth of about nine fathoms. To a novice such an experience entails many unpleasant sensations, but the author deemed himself well rewarded by the sight which met his eyes on the sea-bed, when all pains were forgotten in the interest of his surroundings. It is pointed out that a good many pearls lying near the mouths of the oysters are abstracted by the divers during the return from the fishing grounds to shore. The fishing was continued for a period of about two months, at the end of which the native divers were utterly exhausted. Before the next fishery, the Government hopes to find some more scientific method of reaping this harvest of the sea than the one which has been in vogue for untold centuries.

AN interesting addition has recently been made to the Natural History Museum, South Kensington, by the receipt of specimens of some of the blind cave-fishes of Cuba, which were described by Prof. Poey in his "*Memorias sobre la Historia Natural de la Isla de Cuba*" so long ago as 1856, but which, up to this time, have remained unrepresented in European museums. The special interest of these fishes (*Lucifuga subterraneus* and *Stygicola dentatus*) lies in the fact that their alliance is with salt-water forms (such as *Brotula*) which exist in the neighbouring sea, and not with fresh-water fishes, as is the case with *Amblyopsis* and its allies of the Great Cave of Kentucky. There can be little doubt that the Cuban caves in which the blind fishes are found were formerly in communication with the sea, and that the ancestors of these fishes entered the caves from the adjacent ocean. It is, however, a matter of speculation how long a period of life in darkness it has taken to reduce the eyes of these fishes to their present rudimentary state and to effect the other changes which now distinguish them from their nearest marine relatives.

A SHORT biography of the late Major J. W. Powell, of Washington, has recently been compiled by Mr. G. K. Gilbert from a series of articles by various writers in the *Open Court*. From his early youth he lived a strenuous life, both physical and mental, his varied reading being rectified by much field work. He lost his right arm in the Civil War, in which he served as an engineer. Then he was offered the chair of geology in the Illinois Wesleyan University, and there organised field expeditions as part of the official curriculum in the geological and natural history studies. He resigned his professorship to undertake the exploration of the canyons of the Colorado River, and was the first to descend that dangerous river. Major Powell was appointed director of the U.S. Bureau of Ethnology in 1879, and also director of the U.S. Geological Survey in 1881; the latter office he resigned in 1894, but he kept the former until his death in September, 1902. Not only was Major Powell a hard worker, but he was a stimulating chief and was very fertile in ideas, which he freely gave to others. The loving reverence that was paid to the "Major" by his colleagues comes out strongly in the report (*Science*, November 14, 1902, p. 783) of the meeting that was held before his funeral.

WE have received from the author, Mr. H. H. Bloomer, a paper from the *Journal of Malacology* (vol. x. part iv.) on the anatomy of the molluscs *Pharella orientalis* and *Tagelus rufus*.

THE fourth part of vol. lxxv. of the *Zeitschrift für wissenschaftliche Zoologie* is taken up by two papers on parasitic organisms. In the first, Dr. R. Ritter von Stummer-Traunfels commences a general account of the anatomy and histology of the Myzostomaria, those remarkable annelids parasitic on crinoids and starfishes, with a description of *Myzostoma asteriae*. In the second Mr. F. Schmidt describes *Branchiobdella parasita*, an oligochaete worm infesting the gills of the crayfish.

THE first appendix to the *Kew Bulletin* for the present year has been received. It contains a list of seeds of hardy herbaceous plants and of hardy trees and shrubs which ripened at Kew during the preceding year. The unfavourable conditions which prevailed have considerably reduced the number of species in the list.

THE *Journal of Botany* (January) opens with the first part of an account of R. Brown's list of Madeira plants, which is contributed by Mr. J. Britten. The Rev. W. M. Rogers presents a general list of plants gathered in the three botanical counties which form the subprovince of the north-east Highlands, and gives separately the collections made near Tomatin and Dalwhinnie, two stations situated above the thousand feet level.

SIGNOR F. ARDISSONE has made a study of the flora of Monte Baro, a peak near Lake Como, and publishes a list of the plants collected there in the *Memoirs* of the Lombardy Institute of Science and Arts. Despite the somewhat low altitude and the circumscribed area of the mountain, the number of species is considerable, and the flora contains several types which are sparsely distributed in Lombardy, this being especially noticeable in the case of the orchids.

AN account of the native timber trees is contributed by Mr. A. O. Green to the *Proceedings* of the Royal Society of Tasmania. The author not only describes their specific qualities and uses, but is able to give the results of tests which he has made in order to determine the strength of the more important of these. Owing to the scarcity of soft wood trees in Australasia, it is interesting to note that two valuable pines, the huon pine, *Dacrydium Franklinii*, and the celery-top pine, *Phyllocladus rhomboidalis*, are both said to be common, the former being, however, only locally abundant.

A SMALL brochure upon the application of electricity to the cultivation of plants has been received. The writer, M. Guarini, has summarised the principal experiments which have been recorded under two heads, distinguishing between those in which electricity has been adopted as the source of continuous artificial light and those in which the plant is stimulated by electric currents. The latter method is the more important, and, according to the experiments of M. Lemstroem and others, the results are distinctly beneficial, mainly in the increased amount of growth.

THE *Mitteilungen aus den deutschen Schutzgebieten* contains a new map of the central part of Kamerun, between Sanaga and the eighth parallel of north latitude, by Herr M. Moisel. The scale is 1 : 1,000,000, and the map includes much new and unpublished material.

THE first number of the new volume of the *Abhandlungen* of the Vienna Geographical Society is devoted to the introductory part of a valuable monograph on the Federated Malay States, by Mr. W. R. Rowland. The section issued deals with the physical geography of the region and its flora and fauna. Publication has unfortunately been delayed for

two years, but the paper has been brought up to date by competent hands in Vienna. The second part, which will apparently deal with the development of the States under British protection, is to be accompanied by a map.

THE *National Geographic Magazine* for January contains, besides a number of short articles of interest, a report of an address delivered before the National Geographic Society by Mr. F. H. Newell, chief engineer of the Reclamation Service, United States Geological Survey. The Reclamation Service is responsible for the carrying out of a law passed by Congress in 1902, which provides that the proceeds of the disposal of certain public lands shall be set aside for the construction of irrigation works in the arid regions of the west. Mr. Newell gives some account of the progress of work up to the present time. The paper is illustrated by a number of useful physical maps.

A THIRD edition, which has been greatly enlarged and almost entirely rewritten, of Dr. A. Rabagliati's "Air, Food and Exercises. An Essay on the Predisposing Cause of Disease," has been published by Messrs. Baillière, Tindall and Cox.

MESSRS. CHARLES GRIFFIN AND CO., LTD., have published a third English edition of "The Cyanide Process of Gold Extraction," by Prof. James Park, the first edition of which was reviewed in *NATURE* for June 14, 1900. The text-book has been revised and enlarged, much new material—dealing for the most part with lead-smelting of gold-slimes, the sulpho-telluride ores, and filter-press practice—having been added.

WOMEN workers in all branches of activity will find something useful to them in the "Englishwomen's Year Book and Directory, 1904." Miss Emily Janes, who edits the volume, is to be congratulated upon the completeness of the new issue of this annual publication. The volume contains sections dealing separately with science and education. The former includes brief notices of the research work in science upon which women are at present engaged; a list of the principal scholarships and exhibitions for science attainable by women; and lists of the societies of which women may become members, and of women who are engaged as examiners or lecturers in science. The section of the "Year Book" dealing with education contains an excellent account of the present facilities for the higher education of women in our home universities.

A NEW magazine for technical students, entitled *Technics*, has been started by Messrs. Newnes, Ltd. The new periodical is designed to become the organ of the great body of students of technological science throughout the country. If the magazine, as its founders intend it to do, succeeds in increasing the number of people interested in technical and scientific work, and in becoming a medium for the interchange of ideas between those engaged in technical instruction, it will have fully justified its existence. The contents page of the first number is an exceedingly varied one, ranging as it does from the art of dyeing to the training of chauffeurs. Among the articles may be mentioned a description of the Technical High School at Charlottenburg, by Prof. Dalby; on radium, by Mr. E. Edser; on rapid-cutting steel, by Prof. J. T. Nicolson; and contributions on different aspects of the technical education problem by Sir William Abney, Sir William White and others.

A SECOND edition of vol. ii. of Dr. F. Dannemann's "Grundriss einer Geschichte der Naturwissenschaften" has been published by Mr. W. Engelmann, Leipzig (London: Williams and Norgate). The volume deals with the de-

velopment of scientific knowledge from the time of Thales to the present epoch; and though it is impossible to compress the history of science into 450 pages, the author's survey of progress is excellently conceived and carried out. Original texts and illustrations are given prominence, so that the student who reads the work cannot fail to derive inspiration from it. For students interested in special branches of exact science Ostwald's "Klassiker der exakten Wissenschaften" are available, and for those who require a general view of scientific progress, constructed in the same spirit, Dr. Dannemann's volume is excellently adapted.

WE have received vol. xxii. of the *Geographical Journal*, which contains the monthly parts from July to December, 1903. As usual, the volume is remarkable for the large number of its excellent illustrations and for the plentiful supply and high character of the coloured maps. Among many other valuable contributions the following may be mentioned:—the account of the first year's work of the National Antarctic Expedition, by Sir Clements Markham, K.C.B., F.R.S.; the bathymetrical survey of the fresh-water lochs of Scotland, under the direction of Sir John Murray, K.C.B., F.R.S., and Mr. L. Pullar; a scheme of geography, by Prof. W. M. Davis; terrestrial magnetism in its relation to geography, by Captain E. W. Creak, F.R.S.; four years' Arctic exploration, 1898–1902, by Commander R. E. Peary; and the Alaska boundary, by Colonel Sir T. H. Holdich, K.C.M.G., K.C.I.E.

THE additions to the Zoological Society's Gardens during the past week include a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, presented by Mr. J. Fisher; a Green Monkey (*Cercopithecus callitrichus*) from West Africa, presented by Mr. H. R. Broad; a Japanese Deer (*Cervus sika*) from Japan, presented by Mr. Leopold de Rothschild; a Common Squirrel (*Sciurus vulgaris*), British, presented by Captain Locock; an Allied Hornbill (*Penelopides affinis*) from the Philippine Islands, presented by Mrs. Johnstone; a Rough-legged Buzzard (*Archibuteo lagopus*), European, presented by Mr. E. A. Maling; two Blue and Yellow Macaws (*Ara ararauna*) from South America, presented by Mr. Charles Storey; two Kestrels (*Tinnunculus alaudarius*), British, presented by Mr. A. H. Bishop; a Hainan Gibbon (*Hylobates hainanus*) from the Island of Hainan, a Variegated Spider Monkey (*Ateles variegatus*) from the Upper Amazons, a Crowned Hawk Eagle (*Spizaetus coronatus*) from Africa, a Blue-rumped Parrakeet (*Psephotus haematotus*) from Australia, deposited; a Campbell's Monkey (*Cercopithecus campbelli*) from West Africa, purchased.

OUR ASTRONOMICAL COLUMN.

PECULIAR FORMS OF COMETS' TAILS.—At a meeting of the National Academy (U.S.A.) held at Chicago on November 18, 1903, Prof. E. E. Barnard read a paper dealing with the anomalous appearances sometimes observed on photographs of the tails of comets. Accepting the generally adopted theory that the tails are caused by the repelling action of the sun's light on the cometary particles, he demonstrated that the broken appearance often observed in the tails may be due to the external influence of some resisting medium, possibly groups of meteorites which are in all probability scattered throughout space. Thus the sudden contortions of the tail of Brooks's comet on and after October 22, 1893, might be explained by the supposition that it encountered a swarm of meteorites which caused the extraordinary detachment of the cloud-like masses seen on the photographs obtained between October 22 and November 3. A similar phenomenon might have been produced

had the detached portion of the tail of Borrelly's comet (1903), after its separation from the nucleus, encountered any similar resisting medium. Prof. Barnard directs attention to the fact that in the latter case the detached portion gave no evidence of accelerated motion of repulsion such as would be expected if the repulsion were solely due to the action of the sun's light.

Several beautiful photographic reproductions of the various comets discussed by Prof. Barnard accompany his paper in the January number of *Popular Astronomy*.

ACTINIC QUALITY OF SKY-LIGHT.—Mr. Gavin J. Burns has recently published the results of some experiments made by him in order to determine the relative actinic qualities—not intensities—of the light received from the star-lit sky near the zenith on a clear night, of moonlight, of sunlight, and of the light received from the zenith during the day-time.

With ordinary, bright light-sources the usual method of procedure in determining the ratio of actinic to non-actinic rays (i.e. the actinic quality) in the total radiation is to analyse the latter, in detail, spectroscopically, but in the experiments performed by Mr. Burns the total radiations were far too faint for the application of this method. He therefore divided the spectrum generally into two parts, actinic and non-actinic, and in order to obtain comparative results used layers of two liquids as screens, the first a solution of bichromate of potash, which totally absorbed the blue, violet, and ultra-violet rays, the second a solution of methyl-violet, which absorbed the orange, yellow and green. In each experiment a layer of known absorptive effect was placed between the photographic plate (Edwards's isochromatic) and the light source. The plate was then exposed to the light for a known period and developed, and then the various results were reduced to standard conditions and compared. From the results thus obtained Mr. Burns concludes that the actinic quality of the light which reaches us from the zenith sky by night, when the sun is at least 18° below the horizon, is greater than that of moonlight from the moon on the meridian, or sunlight when the sun has an altitude not greater than 36° . It is also greater than the average value for the light of the blue, cloudless sky by day. On the other hand, the observations give no information as to the real relative actinic qualities of sunlight and sky-light, for observations of both sources at equal altitudes must be made to determine this ratio (*British Astronomical Association Journal*, vol. xiv., No. 2).

THE UNITED STATES NAVAL OBSERVATORY.—The report of the United States Naval Observatory for the year ending June 30, 1903, contains a general review, by the director, Captain C. M. Chester, U.S. Navy, of the personnel, the work and the results obtained during that period.

Among a number of recommendations as to the future work, the director suggests that subsidiary observatories should be founded on several of the islands governed by the United States in the Pacific. Tutuila, Samoa, situated in lat. 15° S., is especially mentioned in this respect as being generally recognised as an ideal site for an astronomical observatory, and it is suggested that 500 of the 1597 stars adopted at the International Conference of Naval Observatory Directors in 1896 should be observed there by an assistant from Washington, who, with the assistance of the naval officers and men already stationed there, could also make observations of the magnetic elements obtaining on the island.

The director also recommends that one of the ships attached to the European Squadron of the U.S.A. Navy should be deputed to assist a small party of astronomers from Washington in observing the total eclipse of the sun in Spain in 1905. In support of this recommendation he quotes from the report of Sir Norman Lockyer, on the Indian eclipse of 1898, as to the valuable assistance rendered by the officers and men of H.M.S. *Melpomene*, at the suggestion and under the direction of that observer, in making observations of various eclipse phenomena.

Each of the sectional reports has been written by the officer in charge of the particular section reported on, but the results obtained are far too numerous to be given in detail here.

The time service, which operates 18 official time balls and